Section 8

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FIGURES

TABLES

8. WAG 6, OU 6-03, EBR-I FUEL OIL, GASOLINE, AND DIESEL TANKS

8.1 Site Descriptions

Five fuel storage tanks were located at the Experimental Breeder Reactor (EBR). These include the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) sites EBR-08, EBR-09, EBR-10, EBR-11, and EBR-12. The locations are shown in the map in Figure 8-1. Each site is described individually in the following sections.

EBR-08 was the site of a steel 16,086-L (4,250-gal) underground storage tank (UST), designated Waste Management Office (WMO)-703, as shown in Figure 8-1. WMO-703 was located south of the WMO building (WMO-601) and addition (WMO-601A) and contained No. 2 diesel heating fuel. Records show that the UST was installed in 1952, was last used in 1988, and was never used for waste disposal.

EBR-09 was the site of a 1,894-L (500-gal) steel UST. The tank (WMO-704) was located approximately 1.2 m (4 ft) south of the northeast corner of the WMO building addition (WMO-601A) and was used to store No. 2 diesel oil for heating WMO-601. Records indicate that the tank was installed in 1952 and used until 1986.

EBR-10 was the site of a 946-L (250-gal) steel UST (WMO-705) used to store gasoline. The tank was located on the south side of the WMO building (WMO-601), and east of the addition to that building (WMO-601A) at the EBR-1 facility. Records indicate that the tank was installed in 1958 and was last used in 1963.

EBR-11 was the site of a 17,033-L (4,500-gal) steel UST (EBR-706). The tank was located west of the EBR-1 reactor building (EBR-601) and annex (EBR-601A), and contained No. 2 diesel fuel used to heat EBR-601. Records indicate that the tank was installed in 1952 and remained in service until 1963.

EBR-12 was the site of a 3,786-L (1,000-gal) UST (EBR-707). The tank stored No. 2 diesel oil used for heating the EBR-1 reactor building (EBR-601) and annex (EBR-601A) and was located west of EBR-601. Records indicate that the tank was installed in 1952 and remained in service until 1963.

8.2 Previous Investigations

8.2.1 EBR-08

A liquid sample collected from the tank on May 23, 1989, for a waste profile analysis showed no hazardous contaminants. Approximately 1,665 L (440 gal) of 52% diesel and 48% water were pumped from the tank on November 2, 1989. The tank, residual amounts of water and diesel, and associated piping were removed from the ground on October 1 and 2, 1990 (see Figure 8-2). Several holes, the largest being 15 cm (6 in.) in diameter, were observed in the tank, and approximately 38 L (10 gal) of diesel had pooled into the bottom of the tank excavation. Diesel-contaminated soil (approximately 73 m^3 [96 yd^3]) and pooled-diesel fuel were removed from the excavation with a backhoe until bedrock was met at a depth of 5.5 m (18 ft). All of the diesel-contaminated soil was removed, with the exception of two small, potentially contaminated areas: (1) a sewer line in the excavation's south side prevented soil removal deeper than 1.5 m (5 ft) because of equipment limitations, and (2) a radiologically contaminated

overhead trolley located 0.6 m (2 ft) east of the excavation hindered soil removal from a small area east of the excavation.

In 1990, after five biased soil samples were collected from the base of the tank excavation, the excavation was backfilled with clean soil. The samples were collected from areas in which the photoionization detector (PID) showed volatile organic compound (VOC) vapor concentrations between 98.6 and 531 ppmv, which is above the Tank Management Program guideline of 50 ppmv. Laboratory analysis showed detections of benzene, toluene, ethylbenzene, and xylenes (BTEX) in each of the soil samples. However, concentrations were equal to or less than the most restrictive exposure scenario's 1E-06 risk-based concentrations for BTEX. Total petroleum hydrocarbons (TPHs)-diesel concentrations ranged from 35,000 to 52,000 mg/kg, which is above the Tank Management Program guideline of 1,000 mg/kg for TPH-diesel. Diesel fuel released from EBR-08 apparently migrated approximately 6 m (20 ft) west to EBR-10, the former location of an underground 946-L (250-gal) gasoline tank. The summary statistics for the soil samples are provided in Appendix C.

The Track 1 decision document for the site recommended that EBR-08 be reclassified as a "No Further Action" site (U.S. Department of Energy Idaho Operations Office [DOE-ID] 1995). However, this decision is subject to review at the time of issuance of the Operable Unit (OU) 10-04 Record of Decision (ROD).

8.2.2 EBR-09

A waste profile analysis performed on May 23, 1989, showed the contents (approximately 208 L [55 gal]) were 100% aqueous and contained 8,347 ug/kg of trichloroethane (TCA). The laboratory reported the tank contained 2,500 ug/L, and the generator's hazardous waste profile sheet indicated that the detection of TCA might have been caused by laboratory error. On September 2, 1992, when a crew arrived to pump out the contents and remove the tank, the tank was found to be dry. It is unknown if the contents had already been pumped out or had leaked. The condition of the tank is unknown because it was left in place in 1992, when excavation revealed the tank was partially underneath the footing of WMO-601. The tank was grouted with cement and a soil cover was placed over the excavation (DOE-ID 1999).

In September of 1992, three soil samples were collected and analyzed for BTEX and TPH-diesel. One sample was collected at the 0- to 0.3-m (0- to 1-ft) depth interval. The remaining two samples were collected at a depth interval of 2.4- to 2.6-m (8- to 8.5-ft). The only detection was for TPH-diesel (36.2 mg/kg) at the 0- to 0.3-m (0- to 1-ft) depth interval.

The Track 1 decision document (DOE-ID 1993a) recommended that the site be reclassified as a "No Further Action" site. However, this decision is subject to review at the time of issuance of the OU 10-04 ROD (DOE-ID 1999).

8.2.3 EBR-10

A May 23, 1989, waste profile analysis indicated the 833 L (220 gal) of product (37% gasoline, 63% water) remaining in the tank contained no hazardous constituents. On August 21, 1990, the contents were pumped from the tank and recycled. During tank excavation in October 1990, VOC soil concentrations up to 230 ppm were detected using a PID. All soils with readings greater than 25 ppm were segregated and disposed of at the Central Facilities Area (CFA) landfill. A total of 26.9 m^3 (35.2 yd^3) were removed to a depth of 2.9 m (9.5 ft).

During tank excavation, five biased soil samples (including one duplicate) were collected and analyzed for BTEX and TPH-gasoline. Ethylbenzene was detected in only two samples (0.9 and 2 mg/kg) and xylenes in three samples (3, 3, and 10 mg/kg). Benzene, toluene, and TPH-gasoline were not detected. Because of the presence of VOC concentrations and the absence of gasoline, the five soil samples were also analyzed for TPH-diesel. Diesel contamination was considered possible because another UST (WMO-703) that stored diesel was located approximately 6 m (20 ft) away. All five samples contained TPH-diesel, and three concentrations (9,200 mg/kg, 11,000 mg/kg, and 19,000 mg/kg) exceeded the State of Idaho guideline of 1,000 g/kg. All TPH-diesel results were associated with the 2.9- to 3.0-m (9.5- to 10-ft) depth interval, whereas the BTEX results were obtained from soils between 2.9 and 3.7 m (9.5 and 12 ft).

Following the removal of the tank, the pit was filled with clean soil. The diesel contamination was addressed in the EBR-08 (WMO-703) Track 1 decision document. The EBR-08 Track 1 decision document (DOE-ID 1994) recommended that the site be reclassified as a "No Further Action" site. However, this decision is subject to review at the time of issuance of the OU 10-04 ROD (DOE-ID 1999).

8.2.4 EBR-11

After a waste profile analysis performed on May 23, 1989, showed the contents of the tank to be nonhazardous petroleum product (approximately 7,078 L [1,870 gal]), the contents were pumped out for recycling on August 21, 1990. The tank and associated piping were removed on September 26, 1990. During the excavation, approximately 27 m^3 (35 yd^3) of soil with PID-detected VOC concentrations greater than 50 ppm were segregated and sent to the CFA landfill.

Three biased soil samples (including one duplicate) were collected from the base of the excavation (2.4 to 3.0 m; 8 to 10 ft below ground surface [bgs]) in September of 1990. The samples were analyzed for BTEX and TPH-diesel. The sample results showed no BTEX contamination and a TPH-diesel concentration (350 mg/kg) in one sample. The excavation was filled with clean soil.

The EBR-11 Track 1 decision document (DOE-ID 1993c) recommended that the site be reclassified as a "No Further Action" site. However, this decision is subject to review at the time of the issuance of the OU 10-04 ROD (DOE-ID 1999).

8.2.5 EBR-12

After a waste profile analysis performed on May 23, 1989, showed the contents of the tank to be nonhazardous petroleum product, the contents of the nearly full tank were pumped out on August 25, 1989. During excavation, approximately 25 m^3 (33 yd^3) of soil with PID-detected VOC concentrations greater than 50 ppm were segregated and sent to the CFA landfill. In September of 1990, three biased soil samples (including one duplicate) were collected from the base of the excavation 0.3 to 2.7 m (1 to 9 ft). The samples were analyzed for BTEX and TPH-diesel. The sample results showed no BTEX contamination and a single TPH-diesel detection (30 mg/kg) in one sample. The excavation was filled with clean soil (DOE-ID 1999).

The EBR-12 Track 1 decision document (DOE-ID 1993a) recommended that the site be reclassified as a "No Further Action" site. This decision is subject to review at the time of issuance of the OU 10-04 ROD (DOE-ID 1999).

8.3 Nature and Extent of Contamination

8.3.1 EBR-08

The five postexcavation samples (including one duplicate) were collected at a nominal depth of 5.5 m (18 ft), and all samples had detections of BTEX and TPH-diesel. Apparently, residual diesel fuel remained at the site as a result of an incomplete contaminated soil removal. Because the site was backfilled with clean soil in 1990, no potential exists for windblown contamination. However, diesel fuel may migrate vertically to the aquifer. Data from two downgradient United States Geological Survey (USGS) monitoring wells, M6S and M7S, which are sampled on a semiannual basis, are provided in Table 8-1. The data indicate no contamination related to diesel fuel has been detected during the past 10 years. Figure 8-3 shows the EBR-I area, M6S and M7S wells, and generalized groundwater flow direction.

8.3.2 EBR-09

The diesel fuel tank was grouted in place, and no contaminated soil was removed from the site. Possible diesel fuel contaminated soil remains at the site as a result of leaving the tank in place. The clean soil cover will likely prevent windblown contaminant dispersal. However, the potential exists for contaminant migration to the aquifer in the area below the soil cover.

8.3.3 EBR-10

There are no data indicating gasoline contamination at the EBR-10 site. Some diesel fuel contamination may remain at the site as a result of an incomplete excavation of contaminated soil. The diesel fuel is likely to have migrated from the EBR-08 site. The clean soil cover installed after tank excavation will likely prevent windblown contaminant dispersal. However, the potential exists for contaminant migration to the aquifer in the area below the soil cover. Data from two downgradient USGS monitoring wells, which are sampled on a semiannual basis, are provided in Table 8-1. The data indicate no contamination related to diesel fuel has been detected during the past 7 years.

8.3.4 EBR-11

Some diesel fuel contamination remains at the site at the excavation depth of 2.4 to 3 m (8 to 10 ft) as a result of an incomplete excavation of contaminated soil. The clean soil cover will likely prevent windblown contaminant dispersal. However, the potential exists for contaminant migration to the aquifer in the area below the soil cover.

8.3.5 EBR-12

Low-level diesel fuel contamination remains at the site as a result of an incomplete excavation of contaminated soil at a depth of 0.3 to 2.7 m (1 to 9 ft). The clean soil cover will likely prevent windblown contaminant dispersal. However, the potential exists for contaminant migration to the aquifer in the area below the soil cover.

Table 8-1. Groundwater monitoring results for wells near EBR-I.

Well Names	M6S	M6S	M6S	M6S	M6S	M6S	M7S	M7S	M7S	M7S	M7S	M7S
Sampling Date	7/28/93	11/2/94	7/18/95	9/25/96	7/14/97	10/7/98	7/27/93	11/2/94	7/18/95	9/25/96	7/14/97	10/7/98
Volatile Organic Compounds	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)
Benzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Toluene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Ethylbenzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Xylenes (total)	1 U	NR	1 U	1 U	1 U	1 U	1 U	NR	1 U	1 U	1 U	1 U

U denotes an Undetect
NR denotes No Record Available

								7 years					
Well Names	M6S	M6S	M6S	M6S	M6S	M6S	M6S	M7S	M7S	M7S	M7S	M7S	M7S	M7S
Sampling Date	10/21/92	7/28/93	4/18/94	4/18/95	4/2/96	4/9/97	5/12/98	10/22/92	4/13/93	4/18/94	4/19/95	4/2/96	4/9/97	5/12/98
Volatile Organic Compounds	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)
Anthracene	11 U	10 U	10 U	10 U	10 U	10 U	10 U	11 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzo(a)pyrene	11 UJ	10 U	10 U	10 U	10 U	10 U	10 U	11 UJ	10 U	10 U	10 U	10U	10 U	10 U
Benzo(b)fluoranthene	11 UJ	10 U	10 U	10 U	10 U	10 U	10 U	11 UJ	10 U	10 U	10 U	10 U	10 U	10 U
Benzo(k)fluoranthene	11 UJ	10 U	10 U	10 U	10 U	10 U	10 U	11 UJ	10 U	10 U	10 U	10 U	10 U	10 U
Benzo(a)anthracene	11 UJ	10 U	10 U	10 U	10 U	10 U	10 U	11 UJ	10 U	10 U	10 U	10 U	10 U	10 U
Benzo(g,h,i)perylene	11 UJ	10 U	10 U	10 U	10 U	10 U	10 U	11 UJ	10 U	10 U	10 U	10 U	10 U	10 U
Chrysene	11 UJ	10 U	10 U	10 U	10 U	10 U	10 U	11 UJ	10 U	10 U	10 U	10 U	10 U	10 U
Fluorene	11 UJ	10 U	10 U	10 U	10 U	10 U	10 U	11 UJ	10 U	10 U	10 U	10 U	10 U	10 U
Fluoranthene	11 UJ	10 U	10 U	10 U	10 U	10 U	10 U	11 UJ	10 U	10 U	10 U	10 U	10 U	10 U
Naphthalene	11 U	10 U	10 U	10 U	10 U	10 U	10 U	11 U	10 U	10 U	10 U	10 U	10 U	10 U
Phenanthrene	11 U	10 U	10 U	10 U	10 U	10 U	10 U	11 UJ	10 U	10 U	10 U	10 U	10 U	10 U
Pyrene	11 UJ	10 U	10 U	10 U	10 U	10 U	10 U	11 UJ	10 U	10 U	10 U	10 U	10 U	10 U

U denotes an Undetect
UJ denotes an Undetect but the value is an estimate

Well Names	M11S	M11S	M11S	M11S	M12S	M12S	M12S	M12S	M13S	M13S	M13S	M13S
Sampling Date	7/98	10/98	1/99	4/99	7/98	10/98	1/99	4/99	7/98	10/98	1/99	4/99
Volatile Organic Compounds	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)
Benzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Toluene	1	0.3 J	1 U	1 U	0.2 J	1 U	1 U	1 U	0.4 J	1 U	1 U	1 U
Ethylbenzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Xylenes (total)	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U

U denotes an Undetect.
J denotes an estimated quantity

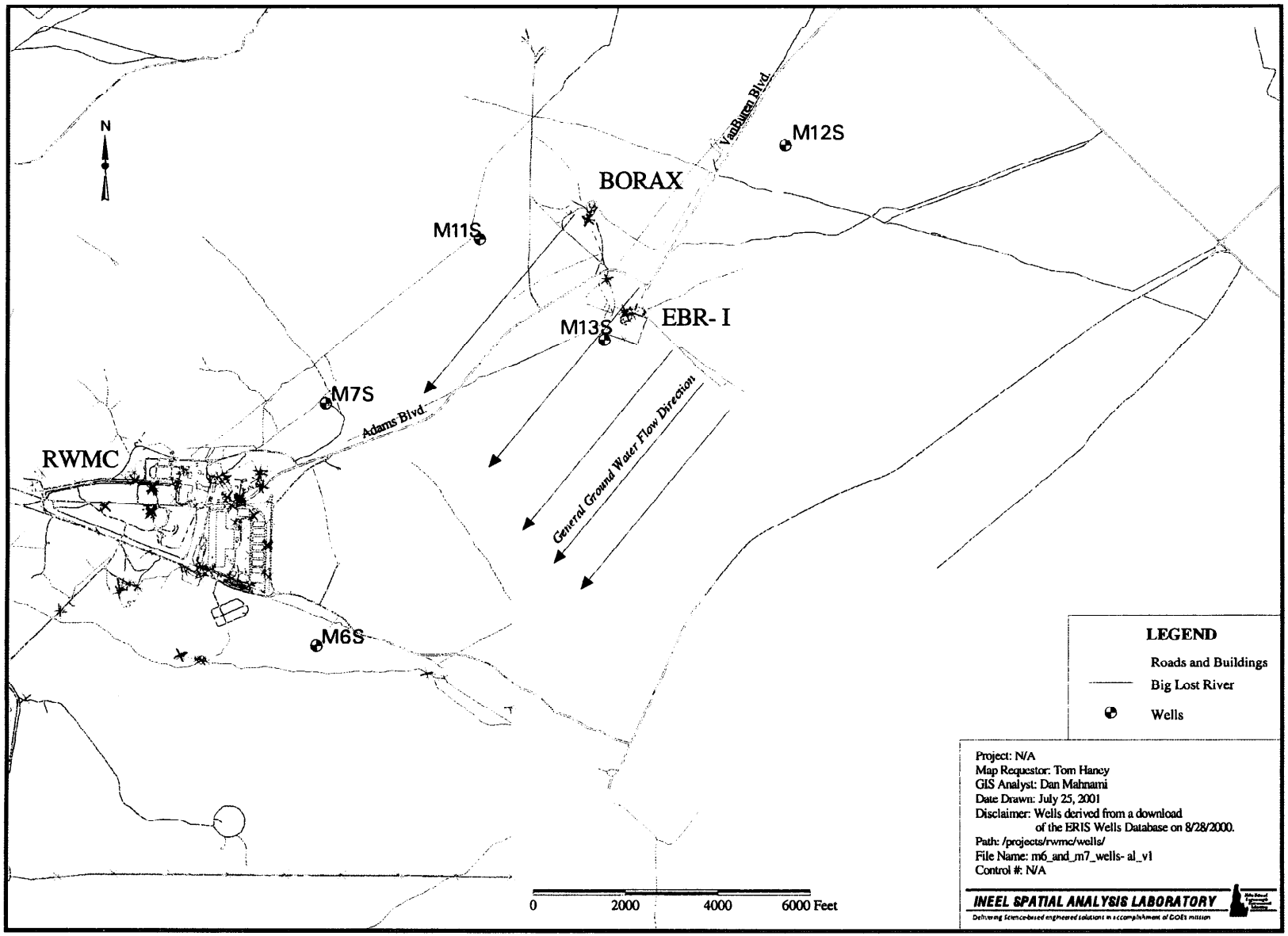

Figure 8-3. EBR-I area, aquifer wells and generalized groundwater flow direction.

8.4 Preliminary Screening

The tables presented here include only those contaminants of potential concern (COPCs) identified as concerns. The complete screening tables for EBR-08, -09, -10, -11, and -12 can be found in Appendix C.

8.4.1 EBR-08

The soil data collected from the 1990 postexcavation sampling efforts were screened for COPCs. The results of that screening are presented in Table 8-2. The human health risk assessment (HHRA) and ecological risk assessment (ERA) screening methodology are discussed in Section 4 and presented in detail in Appendices D and F, respectively. Benzene and TPH-diesel were retained as COPCs for the HHRA. TPH-diesel and xylene were retained as COPCs for the ERA.

8.4.2 EBR-09

The soil data collected from the 1992 sampling effort were screened for COPCs. The results of that screening are presented in Table 8-3. The HHRA and ERA screening methodology are discussed in Section 4 and presented in detail in Appendices D and F, respectively. No analytes were retained as COPCs for the HHRA. TPH-diesel was the only analyte retained as a COPC for the ERA.

8.4.3 EBR-10

The soil data collected from the 1990 excavation sampling were screened for COPCs. The results of that screen are presented in Table 8-4. The HHRA and ERA screening methodology are summarized in Section 4 and presented in detail in Appendices D and F, respectively. Only TPH-diesel was retained as a COPC for the HHRA. Both TPH-diesel and xylene were retained as COPCs for the ERA.

8.4.4 EBR-11

The soil data collected from the 1990 excavation sampling were screened for COPCs. The results of that screen are presented in Table 8-5. The HHRA and ERA screening methodology are discussed in Section 4 and presented in detail in Appendices D and F, respectively. Only TPH-diesel was retained as a COPC for the ERA. No COPCs were retained for the HHRA.

8.4.5 EBR-12

The soil data collected from the 1990 excavation sampling were screened for COPCs. The results of that screen are presented in Table 8-6. The HHRA and ERA screening methodology are discussed in Section 4 and presented in detail in Appendices D and F, respectively. Only TPH-diesel was retained as a COPC for the ERA. No COPCs were retained for the HHRA.

Table 8-2. Soil contaminant screening process for OU 10-04, WMO-703, EBR-08 Soil.

		Step 1		Step 2	Step 3		Step 4		Site COPC	
Detected Contaminants	Max. Source Concentration (mg/kg)	INEEL Background Concentration (mg/kg)	Max. Concentration > Background	Nontoxic Metal	Region 9/3 RBC (mg/kg)	Max. Concentration > RBC	INEEL EBSL (mg/kg)	Max. Concentration > EBSL	HHRA	ERA
Benzene	2	NA	NA	No	6.72E-01	Yes	5.50E+00	No	Yes	No
TPH-diesel	52,000	NA	NA	No	1.00E+03[a]	Yes	No EBSL	No EBSL	Yes	Yes
Xylene	72	NA	NA	No	2.10E+02	No	2.78E-01	Yes	No	Yes

Source: Waste Area Group (WAG) 10, OU 10-04 Database.

"NA" in Step 1 indicates that a background value is not available.

"No RBC" indicates that an Environmental Protection Agency (EPA) Region 9 or 3 risk-based concentration based on residential soil ingestion is not available.

"No EBSL" indicates that an Idaho National Engineering and Environmental Laboratory (INEEL) ecologically based screening level is not available.

a. Risk-based concentration (RBC) for TPH-diesel is INEEL Tank Management Program cleanup level (personal communication from G.C. Bowman, Director of the Department of Energy Idaho Operations Office [DOE-ID] Environmental Protection Division, November 29, 1989).

Table 8-3. Soil contaminant screening process for OU 10-04, WMO-704, EBR-09 soil.

		Step 1		Step 2	Step 3		Step 4		Site COPC	
Detected Contaminants	Max. Source Concentration (mg/kg)	INEEL Background Concentration (mg/kg)	Max. Concentration > Background	Nontoxic Metal	Region 9/3 RBC (mg/kg)	Max. Concentration > RBC	INEEL EBSL (mg/kg)	Max. Concentration > EBSL	HHRA	ERA
TPH-diesel	3.62E+01	NA	NA	No	1.00E+03[a]	No	No EBSL	No EBSL	—	Yes

"NA" in Step 1 indicates that a background value is not available.

"No RBC" indicates that an EPA Region 9 or 3 risk-based concentration based on residential soil ingestion is not available.

"No EBSL" indicates that an INEEL ecologically based screening level is not available.

a. RBC for TPH-diesel is INEEL Tank Management Program cleanup level (personal communication from G.C. Bowman, Director of the DOE-ID Environmental Protection Division, November 29, 1989).

Table 8-4. Soil contaminant screening process for OU 10-04, EBR-10 (WMO-705).

	Step 1			Step 2	Step 3		Step 4		Site COPC	
Detected Contaminants	Max. Source Concentration (mg/kg)	INEEL Background Concentration (mg/kg)	Max. Concentration > Background	Nontoxic Metal	Region 9/3 RBC (mg/kg)	Max. Concentration > RBC	INEEL EBSL (mg/kg)	Is Max. Concentration > EBSL	HHRA	ERA
TPH-diesel	1.90E+04	NA	NA	No	1.00E+03[a]	Yes	No EBSL	No EBSL	Yes	Yes
Xylene	1.00E+01	NA	NA	No	2.10E+02	No	2.78E-01	Yes	No	Yes

Source: WAG 10, OU 10-04 Database and TIDD.

"NA" in Step 1 indicates that a background value is not available.

"No RBC" indicates that an EPA Region 9 or 3 risk-based concentration based on residential soil ingestion is not available.

"No EBSL" indicates that an INEEL ecologically based screening level is not available.

a. RBC for TPH-diesel is INEEL Tank Management Program cleanup level (personal communication from G.C. Bowman, Director of the DOE-ID Environmental Protection Division, November 29, 1989).

Table 8-5. Soil contaminant screening process for OU 10-04, EBR-11 (EBR-706).

	Step 1			Step 2	Step 3		Step 4		Site COPC	
Detected Contaminants	Max. Source Concentration (mg/kg)	INEEL Background Concentration (mg/kg)	Max. Concentration > Background	Nontoxic Metal	Region 9/3 RBC (mg/kg)	Is Max. Concentration > RBC	INEEL EBSL (mg/kg)	Max. Concentration > EBSL	HHRA	ERA
TPH-diesel	3.50E+02	NA	NA	No	1.00E+03[a]	No	No EBSL	No EBSL	No	Yes

Source: WAG 10, OU 10-04 Database and TIDD.

"NA" in Step 1 indicates that a background value is not available.

"No RBC" indicates that an EPA Region 9 or 3 risk-based concentration based on residential soil ingestion is not available.

"No EBSL" indicates that an INEEL ecologically based screening level is not available.

a. RBC for TPH-diesel is INEEL Tank Management Program cleanup level (personal communication from G.C. Bowman, Director of the DOE-ID Environmental Protection Division, November 29, 1989).

Table 8-6. Soil contaminant screening process for OU 10-04, EBR-12 (EBR-707).

		Step 1		Step 2	Step 3		Step 4		Site COPC	
Detected Contaminants	Max. Source Concentration (mg/kg)	INEEL Background Concentration (mg/kg)	Max. Concentration > Background	Nontoxic Metal	Region 9/3 RBC (mg/kg)	Is Max. Concentration > RBC	INEEL EBSL (mg/kg)	Is Max. Concentration > EBSL	HHRA	ERA
TPH-diesel	3.00E+01	NA	NA	No	1.00E+03[a]	No	No EBSL	No EBSL	No	Yes

Source: WAG 10, OU 10-04 Database and T1DD

"NA" in Step 1 indicates that a Background value is not available.

"No RBC" indicates that an EPA Region 9 or 3 risk-based concentration based on residential soil ingestion is not available.

"No EBSL" indicates that an INEEL ecologically based screening level is not available.

a. RBC for TPH-diesel is INEEL Tank Management Program cleanup level (personal communication from G.C. Bowman, Director of the DOE-ID Environmental Protection Division, November 29, 1989).

8.5 Risk Assessment

Table 8-7 presents the exposure point concentrations calculated for the EBR sites discussed below. Appendix C contains summary statistics and exposure point concentrations used for the HHRA and the ERA.

Table 8-7. Summary Exposure Point Concentrations for EBR Sites (concentration units are mg/kg or pCi/g; bin depths are in feet.)

COPC	0-0.5 ft	0-4 ft	0-10 ft	0-18 ft
EBR-08				
Benzene	0.00E+00	1.75E+00	1.90E+00	1.94E+00
TPH-Diesel	0.00E+00	3.99E+04	4.33E+04	4.43E+04
Xylene	0.00E+00	5.69E+01	6.18E+01	6.32E+01
COPC	0-0.5 ft	0-4 ft	0-10 ft	
EBR-09				
TPH-Diesel	3.62E+01	3.62E+01	1.81E+01	
COPC	0-0.5 ft	0-4 ft	0-10 ft	0-12 ft
EBR-10				
TPH-Diesel	0.00E+00	0.00E+00	9.00E+03	1.00E+04
Xylene	0.00E+00	0.00E+00	6.00E+00	6.67E+00
COPC	0-0.5 ft	0-4 ft	0-10 ft	
EBR-11				
TPH-Diesel	0.00E+00	0.00E+00	1.50E+02	
COPC	0-0.5 ft	0-4 ft	0-10 ft	
EBR-12				
TPH-Diesel	0.00E+00	2.63E+01	2.85E+01	

8.5.1 Human Health

8.5.1.1 Human Health Risk Assessment for EBR-08. The EBR-I facility is a National Historic Landmark and is not continuously occupied. Therefore, the occupational exposure scenario is not applicable. Because the excavation at the EBR-08 site was backfilled with clean soil after the tank was removed, the soil inhalation and ingestion pathways for future residential exposure were effectively eliminated. Exposure to groundwater remains the pathway of concern for a future residential scenario. The groundwater exposure pathway was analyzed using the Idaho Department of Environmental Quality (IDEQ) Risk-Based Corrective Action (RBCA) guidance modeling program. The RBCA model does not include a future residential scenario, but does include a current residential scenario. The current residential scenario results are used here to conservatively bound potential risks to future residents.

The RBCA analysis was performed based on data contained in the WAG 10 Environmental Restoration Information System (ERIS) database for the five biased soil samples collected at the base of

the EBR-08 excavation in 1990. The BTEX values for the five samples were directly entered into the RBCA model. However, the TPH-diesel had to be split out into the polycyclic aromatic hydrocarbon (PAH) constituents that make up diesel fuel. The percent weight contents of the PAHs were derived from Gustafson et al. (1997), which lists a range of weight percent fractions for each PAH compound. The average of the range for each PAH compound was calculated and then multiplied by the 52,000 mg/kg maximum detected TPH concentration to give an estimated concentration for each PAH compound. These estimated values were used in the RBCA model.

The results of the RBCA model showed a total risk of 7.05E-6 and a hazard index of 8.79E-1 for current residential exposure through ingestion and indoor/outdoor inhalation of groundwater. The RBCA model results are presented in greater detail in Appendix L. Taking into account the effects of biodegradation and dispersion over 100 years, the risk and hazard index for the future residential scenario would be well below target cleanup levels.

8.5.1.2 Human Health Risk Assessment for EBR-09. No HHRA was performed for this site. The single detection of TPH-diesel at 36.2 mg/kg is well below the state RBCA action limit of 1,000 mg/kg TPH-diesel. Therefore, no further evaluation is required.

8.5.1.3 Human Health Risk Assessment for EBR-10. The EBR-I facility is a national historic landmark and is not continuously occupied. Therefore, the occupational exposure scenario is not applicable. Because the excavation at the EBR-10 site was backfilled with clean soil after the tank was removed, the soil inhalation and ingestion pathways for future residential exposure were effectively eliminated. Exposure to groundwater remains the pathway of concern for a future residential scenario. The groundwater exposure pathway was analyzed using the IDEQ RBCA guidance modeling program. The RBCA model does not include a future residential scenario, but does include a current residential scenario. The current residential scenario results are used here to conservatively bound potential risks to future residents.

The RBCA analysis was performed based on data contained in the WAG 10 ERIS database for the five biased soil samples collected from the EBR-10 excavation in 1990. The BTEX values for the five samples were directly entered into the RBCA model. However, the TPH-diesel had to be split out into the PAH constituents that make up diesel fuel. The percent weight contents of the PAHs were derived from Gustafson et al. (1997), which lists a range of weight percent fractions for each PAH compound. The average of the range for each PAH compound was calculated and then multiplied by the 19,000 mg/kg maximum detected TPH concentration to give an estimated concentration for each PAH compound. These estimated values were used in the RBCA model.

The results of the RBCA model showed a total risk of 5.54E-7 and a hazard index of 5.73E-1 for current residential exposure through ingestion and indoor/outdoor inhalation of groundwater. The RBCA model results are presented in greater detail in Appendix L. Taking into account the effects of biodegradation and dispersion over 100 years, the risk and hazard index for the future residential scenario would be well below target cleanup levels.

8.5.1.4 Human Health Risk Assessment for EBR-11. No HHRA was performed for this site. The single detection of TPH-diesel at 350 mg/kg is well below the state RBCA action limit of 1,000 mg/kg TPH-diesel. Therefore, no further evaluation is required.

8.5.1.5 Human Health Risk Assessment for EBR-12. No HHRA was performed for this site. The single detection of TPH-diesel at 30 mg/kg is well below the state RBCA action limit of 1,000 mg/kg TPH-diesel. Therefore, no further evaluation is required.

8.5.1.6 Human Health Risk Assessment for Composite Groundwater Impacts. The EBR-I site is a historical landmark, which negates the occupational exposure pathway and future residential development scenario inside the EBR-I facility perimeter. In the extremely unlikely event that future residences were built inside the EBR-I site perimeter, each house or structure built on or next to the former UST sites, would have to undergo a separate RBCA evaluation. A current resident RBCA scenario was conducted for the groundwater pathway scenario and evaluated for the individual sites of concern within the EBR-I perimeter (EBR-08 and EBR-10). As discussed in the preceding sections, no unacceptable risk to human health was identified. The groundwater exposure pathway to an offsite receptor is the only plausible exposure risk scenario that should be evaluated. The scenario for offsite downgradient residential development is not likely but is possible. In this case, the EBR-I site would be viewed as a point source for leaching petroleum contaminants to the groundwater. The offsite groundwater scenario was not performed because the well data from the two closest monitoring wells showed (after 7 years of monitoring) no evidence of contamination. Previous site investigations and risk assessments (Track 1s for WMO-703/EBR-08 and WMO-705/EBR-10) present conclusions that are in agreement with the results performed in this study. Previous comments made by the regulatory agencies about the groundwater contamination issues at EBR-I indicated the Agencies' desire to see the actual well data to provide additional evidence that no groundwater contamination was present.

Under the offsite scenario, all the UST sites were summed as a single point source. The precedence for using the single point source scenario comes from the IDEQ.[a] A single point source would be used to determine the risk to downgradient offsite receptors. Data have been collected from several monitoring wells in the vicinity of EBR-I. As evident in Figure 8-3, the accepted groundwater flow direction, derived from Garabedian 1992, and its proximity to EBR-I make the M13S well the best candidate for showing groundwater contamination from potential sources at EBR-I. Data from this well have shown no indication of groundwater contamination above the detection limit related to diesel fuel. The analytical results for the M6S and M7S wells were also evaluated, but their distance from a potential EBR-I source and the possibility that they are cross gradient from EBR-I precludes their use as reliable indicators of contamination to the aquifer. Given this qualification, none of the data from M6S and M7S show an indication of groundwater contamination above the detection limit related to diesel fuel. Recent studies hypothesize that variable groundwater flow in the RWMC area is related to seasonal recharge from the nearby spreading areas. Although it is unknown if the reverse flow directions hypothesized for RWMC extend to EBR-I, data from two wells upgradient from EBR-I, M11S and M12S, were also evaluated. These wells were sampled twice in 1998 and 1999. Data from these two wells did not show an indication of groundwater contamination above the detection limit related to diesel fuel with the exception of a single detection of toluene at 1 ppb in a sample collected from M11S in 1998. Table 8-1 shows the analytical results for the wells near EBR-I that were evaluated.

8.5.2 Ecological

8.5.2.1 Ecological Risk Assessment for EBR-08. The COPCs for the ERA are TPHs and xylene in subsurface soils. However, because the detected contamination is below 3 m (10 ft), no significant pathway exists to ecological receptors. Therefore, this site was not evaluated for ecological risks.

8.5.2.2 Ecological Risk Assessment for EBR-09. The COPCs for the ERA are TPHs in subsurface soils. Toxicity reference values (TRVs) for benzene were used to assess ecological risk

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[a]. Bruce Wicherski, Idaho Department of Environmental Quality (IDEQ), 1410 N. Hilton, Boise, ID 83706, personal telecommunications, bwichers@deq.state.id.us.

because TRVs are not available for TPH-diesel. Benzene is the most hazardous chemical found in TPH-diesel and, therefore, conservatively bounds the potential effects. Only risk to mammalian receptors was evaluated. Risk from this COPC to birds, reptiles, amphibians, invertebrates and plants could not be evaluated because of the lack of toxicity data to develop TRVs. Hazard Quotients (HQs) for all mammalian receptors were less than 1.0. Therefore, this site poses limited risk to ecological receptors.

8.5.2.3 Ecological Risk Assessment for EBR-10. The COPCs for the ERA are TPHs and xylene in subsurface soils. However, because the detected contamination is at or below (3 m [10 ft]), no significant pathway exists to ecological receptors. Therefore, this site poses limited risk to ecological receptors.

8.5.2.4 Ecological Risk Assessment for EBR-11. The COPCs for the ERA are TPHs in subsurface soils. However, because the detected contamination is 2.4 to 3 m (8 to 10 ft) bgs, no significant pathway exists to ecological receptors. Therefore, this site poses limited risk to ecological receptors.

8.5.2.5 Ecological Risk Assessment for EBR-12. The COPCs for the ERA are TPHs in subsurface soils. However, because the detected contamination is within the 2.7-m (9-ft) range, no significant pathway exists to ecological receptors. Therefore, this site poses limited risk to ecological receptors.

8.5.3 Native American

The INEEL is within the aboriginal territories of the Shoshone-Bannock Tribes. A wide variety of natural and cultural resources and areas that directly reflect tribal cultural heritage and native landscape ecology are preserved on the INEEL. These resources are important in maintaining tribal spiritual and cultural values and activities, oral tradition and history, mental and economic well being, and overall quality of life. Appendix A contains a qualitative analysis of WAGs 6 and 10 prepared by the Shoshone-Bannock Tribal Risk Assessment Committee. General tribal concerns about EBR-I and associated release sites are summarized in Section 6.2.4.

8.6 Uncertainties

To limit the amount of information repeated in individual uncertainty sections, only the specific uncertainties associated with each site or area will be discussed within its section. General uncertainties associated with the HHRA are in Appendix D; general uncertainties associated with the ERA can be found in Appendix F.

8.6.1 EBR-08

The total quantity of diesel fuel released from this site is unknown and cannot be quantified from personnel interviews or past records. Therefore, the RBCA Tier I default source volume of 2.3 m^3 (3 yd^3) of diesel-contaminated soil was used. This assumption is considered conservative, because all of the stained soil down to bedrock was removed and biodegradation of remaining contamination is likely to have occurred in the 10 years since the tank was removed.

8.6.2 EBR-09

Because TRVs could not be developed for receptors other than mammals, the potential ecological effects to these receptors could not be evaluated. Although ecological effects may be possible, especially

considering that the TPH contamination was detected near the surface, these effects may be ameliorated by biodegradation since 1992, when the contamination was detected.

8.6.3 EBR-10

The total quantity of diesel fuel released from the site is unknown and cannot be quantified from personnel interviews or past records. Therefore, the RBCA Tier I default source volume of 2.3 m^3 (3 yd^3) of diesel-contaminated soil was used. This assumption is considered conservative, because all of the stained soil down to bedrock was removed, and biodegradation of remaining contamination is likely to have occurred in the years since the tank was removed. Risks may be underestimated for dermal absorption of TPH-diesel and the PAH and BTEX components of diesel fuel from soil due to the lack of RfDs; however, the magnitude of the underestimation is not expected to be substantial.

8.6.4 EBR-11

Although ecological effects may be possible, exposures to ecological receptors are significantly less than modeled due to the depth of contamination (2.4 to 3 m [8 to 10 ft]). These effects should be ameliorated by biodegradation since 1990, when the contamination was detected.

8.6.5 EBR-12

Although ecological effects may be possible, exposures to ecological receptors are significantly less than modeled due to the depth of contamination (2.4 to 3 m [8 to 10 ft]) bgs. These effects may be ameliorated by biodegradation since 1990, when the contamination was detected.

8.7 Conclusions and Recommendations

8.7.1 EBR-08

The potential human health risk to future residents is below target cleanup levels, and no significant pathway to ecological receptors exists. Based on this analysis, the EBR-08 site is recommended for no further action and will not be addressed in the feasibility study (FS).

8.7.2 EBR-09

All COPCs for human health for the soil samples taken after the tank excavation were screened and all detected levels were below preliminary remediation goals (PRGs) and HQs. Ecological risk is also below target levels. Therefore, this site is recommended for no further action and will not be evaluated in the FS.

8.7.3 EBR-10

The potential human health risk to future residents is below target cleanup levels, and no significant pathway to ecological receptors exists. Based on this analysis, the EBR-10 site will not be addressed in the FS.

8.7.4 EBR-11

The potential human health risk to future residents is below target cleanup levels, and no significant pathway to ecological receptors exists. Therefore, this site is recommended for no further action and will not be evaluated in the FS.

8.7.5 EBR-12

All soil samples taken at the base of the excavation screened for all COPCs for human health and all detected levels were below PRGs and HQs. The risk to ecological receptors is limited because of the lack of a significant pathway to these receptors. Therefore, this site is recommended for no further action and will not be evaluated in the FS.

8.8 References

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